High Performance Thin Films from Solution Processible Two-Dimensional Nanoplates
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SUMMARY
UCLA researchers in the departments of Chemistry and Materials Science have recently developed a novel material for use in flexible, printed electronics.

BACKGROUND
Producing cheap, lightweight, and flexible electronics requires depositing electronic materials onto flexible, plastic substrates. Traditional methods of material deposition require high temperatures and/or pressures in order to produce high quality materials that are sufficiently conductive. The current material of choice for use in conductive thin films is indium tin oxide (ITO); however the cost and quality of the material make it prohibitive for cheap, flexible electronics. An ideal conductive thin film would maintain its excellent electronic transport characteristics while granting additional benefits, such as flexibility and the ability to be printed directly onto plastic substrates.

INNOVATION
UCLA researchers in the departments of Chemistry and Materials Science have recently developed a novel material based on semiconducting nanoplates for use in flexible, printed electronics. Researchers started by carefully growing two-dimensional nanoplates and then suspending them in solution to make colloidal ink. The nanoplate ink can be directly printed onto plastic substrates, while the colloidal nature of the ink reduces clumping and allows for uniform deposition. The resulting thin film is highly conductive due to the high surface area connectivity that results from the stacked nanoplates. The nanostructure additionally allows for the greater mechanical compliance needed in flexible applications. The nanoplate ink allows for highly conductive thin films to be directly printed onto flexible plastic substrates.

APPLICATIONS
- Printed electronics
- Flexible electronics
- Conformal, conductive coatings

ADVANTAGES
- Higher conductivity than similar conductive colloidal inks
- Inexpensive deposition method when compared to traditional methods
- Greater mechanical compliance for flexible applications

STATE OF DEVELOPMENT
A working prototype has been developed and tested.

PATENT STATUS
Patent Pending

RELATED MATERIALS
- Solution Processable Colloidal Nanoplates as Building Blocks for High-Performance Electronic Thin Films on Flexible Substrates, Zhaoyang Lin et al., Nano Letters 2014 14 (11), 6547-6553

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS
- Graphene Nanomesh As A Continuos Semiconducting Thin Film For Large Scale Field Effect Transistors
- Vertical Heterostructures for Transistors, Photodetectors, and Photovoltaic Devices
- Graphene Moisture-Resistive Membrane Cathode for Li-Air Battery in Ambient Conditions
- Chemical Vapor Deposition Growth of the Large Single Crystalline Domains of Monolayer and Bilayer
- Graphene Based Catalysts for Biomimetic Generation of Antithrombotic Species
- Palladium Alloy Hydride Nano Materials
- Nanoscale Optical Voltage Sensors
- Ultrathin Nanowires As Highly Efficient Electrocatalysts
- Pore Size Engineering Of Porous Carbons Using Covalent Triazine Frameworks As Precursors
Gateway to Innovation, Research and Entrepreneurship

- The Method of Enhanced Pressure Sensing Performance for Pressure Sensors
- High Performance PtNiCuMo Electrochemical Catalyst
- A General Solution-Processable Approach To High-Quality Two-Dimensional Ink Materials For Printable High-Performance Large-Area And Low-Cost Electronics/Optoelectronics/Thermoelectrics
- Approaching Schottky-Mott Limit in Van Der Waals Metal Semiconductor Contacts
- Double-Negative-Index Ceramic Aerogels For Thermal Superinsulation